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EXAMINER

CHACE, CHRISTIAN

ART UNIT PAPER NUMBER

2189

DATE MAILED: 04/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/004,090	Applicant(s) KOWALCHIK ET AL.	
	Examiner Christian P. Chace	Art Unit 2189	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 3/1/06 (interview).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 12-20, 22, 23, 31, 33 and 35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 12-20, 22, 23, 31, 33 and 35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. <u>4/1/06</u> |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

This Office action has been issued in response to applicant-initiated interview 1 March 2006. Claims 1-9, 12-20, 22-23, 31, 33, and 35 are pending. Applicants' arguments have been carefully and respectfully considered, however, they are not entirely persuasive, as will be discussed in more detail below. This action is NOT final.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-9, 12-20, 22-23, 31, 33, and 35 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for using #106 in figure 7 as a RAID, as well as all of 100a, 106, 100n as a RAID in page 9 and page 12 of the instant specification, e.g., does not reasonably provide enablement for two different RAIDs across ALL of 100a, 106, and 100n (2 RAIDs on all of the disks at the same time). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims. Independent claim 35 appears to be much broader in scope than the instant disclosure as originally filed. The remaining claims depend upon claim 35, and are rejected for at least the reasons set forth supra with respect to same.

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The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-9, 12-20, 22-23, 31, 33, and 35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent claim 35 recites, "multiple small form factor magnetic disk drives," in line 16. Are these in addition to the at least one magnetic disk drive supra? Lines 13-14 recite each storage device having at least one magnetic disk drive, and then lines 15-16 recite *the* storage device having multiple form factor magnetic disk drives. It appears the antecedent basis in the claim for each storage device and the storage device may be confused or overlapping.

In addition, line 7 recites, "the array." It is unclear which array applicants are referring to – is it the set or the first array, or yet another array?

With respect to claim 33, the word "consisting" in line 3 is "close-ended." "Essentially" is open-ended. Which is it? What are the metes and bounds of "consisting essentially of?"

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, 12-20, and 22-23, and 31, 33, and 35 are rejected under 35 U.S.C. 103(a) as being obvious over Brant et al (US Patent #5,805,787) in view of "The RAID Book," 6th Edition.

With respect to independent claim 35, Brant et al disclose:

A data storage system is disclosed in figure 1 as all of figure 1.

A set of storage devices, each storage device being configured to store and retrieve data in response to data access commands from a set of external host computers is disclosed in figure 1. While one host is shown, column 5, line 48 discloses more than one, although examiner notes that a “set” may, in fact, include only one item. The storage devices may be all of #16, #22 or any portion thereof, and/or, in addition, #25.

A “first-tier RAID control circuitry” coupled to the set of storage devices applying a first RAID scheme on the set of storage devices in a manner that treats the set of storage devices as a first array under the application of the first RAID scheme is disclosed in figure 1 as array 22.

A set of sub-devices being treated as a second tier RAID under the application of a second RAID scheme is taught in column 6, lines 24-28, which discloses splitting the array 22 into two separate arrays, each being controlled by their respective controller. Also, see column 6, lines 55-58, e.g. Each controller implementing a different RAID is disclosed in column 5, lines 29-45, which discloses different RAID schemes at different hierarchical levels, or tiers.

The storage devices having different disk drives is disclosed in column 6, line 16 and column 6, lines 57-58.

The remaining limitations of the claim are interpreted to be the RAID-within-a-RAID system disclosed in the instant specification at pages 9 and 12. As examiner understands the instantly claimed invention based on applicants’ remarks in the instant amendment, #106 in figure 7 has it’s own respective controller, and would operate in a RAID configuration of some kind, such as level 1, which is mirroring. Then, RAID controller #116 would operate each of #100a-n as well as #106 as separate disks, all operating under a different RAID scheme, such as

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level 0, or striping. Brant et al do not explicitly disclose such a hybrid system, although various RAID configurations and array configurations are, indeed, disclosed, including arrays that include both large and small form factor disks.

However, The RAID Book, 6th Edition, does disclose such a hybrid system in all of Chapter 8, entitled, "Hybrid RAID arrays," on pages 151-161, e.g. Specifically, however, the footnote on page 39, discusses arrays having members that are themselves arrays.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to utilize an array as itself a member of another array, to allow for even greater flexibility, as disclosed by the RAID book on page 39; and to hybridize such arrays, as disclosed in chapter 8, to improve RAID array I/O performance by combining multiple types of RAID protection and mapping into the same array, as discussed on page 151.

With respect to claim 1, more than two disk drives are disclosed in figure 1 as #22. Those disk drives having platter sizes less than 3.5 inches in diameter is disclosed in column 3, lines 44-46.

A "second-tier" controller that accesses the disk drives in response to received I/O requests (column 5, line 35, for example) is disclosed in figure 1 as #20, and it's operation is further discussed in column 6, line 35, for example. I/O is merely the tasks of gathering data for a computer or program to work with, and making the results of the computer's activities known to the user or other processes. Gathering is usually performed by input devices such as keyboard, mouse, and/or disk drives, while the output is usually made available to the user via the display and the printer and via the disk files or communications ports for the computer.

The controller “simultaneously performing at least a part of at least two write operations onto said more than two disk drives in response to at least two different write requests is disclosed in column 1, lines 44-45 as “servicing [two different write] requests in parallel,” in column 2, lines 55-56 as, “A given controller can concurrently service a plurality of data recovery operations,” and in column 5, lines 29-31 as, “A storage subsystem that has the MB cost of disk coupled with the performance of many disks operated in parallel can fill several intermediate slots in this hierarchy.”

With respect to claim 2, a device interface to receive I/O requests is disclosed in figure 1, #16.

The device interface comprising an interface configured to conform to a protocol is disclosed in column 6, lines 39-44, where the protocol is “SCSI-type connections.”

With respect to claim 3, the protocol comprising at least one of the following: SCSI, Fibre Channel, and “Infiniband” is disclosed in column 6, lines 39-44, which specifically discloses SCSI.

With respect to claim 4, the platter sizes comprising at least one of the following platter sizes: 2.5 inches, 1.8 inches, and 1 inch in diameter is disclosed in column 3, lines 44-46, which not only discloses the 1.8 inch diameter disk, but also states that “(or smaller)” [would work in the invention]. “Or smaller” would include the 1 inch diameter as well.

With respect to claims 5, 17, and 23, at least one of the disk drives comprising an IDE drive is disclosed in column 6, lines 22-24.

With respect to claims 6 and 22, the more than two disk drives having platter sizes less than 3.5 inches in diameter comprising more than two disk drives having platter sizes 2.5 inches

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or less in diameter is disclosed in column 3, lines 44-46, which not only discloses the 1.8 inch diameter disk, but also states that “(or smaller)” [would work in the invention]. “Or smaller” would include the 1 inch diameter as well.

With respect to claim 7, the more than two disk drives having platter sizes less than 3.5 inches in diameter comprising more than two disk drives having platter sizes one inch in diameter or less is disclosed in column 3, lines 44-46, which not only discloses the 1.8 inch diameter disk, but also states that “(or smaller)” [would work in the invention]. “Or smaller” would include the 1 inch diameter and smaller as well.

With respect to claim 12, the RAID data comprising at least one of a stripe, an error detection code, and an error correction code, is disclosed in column 3, lines 11-12 and 19-20, where reconstruction based on parity is error correction, and parity comparisons are error detection. Striping is used in RAID applications, which are discussed in column 5, lines 34, 36, and 44, for example.

With respect to claim 13, the data storage device performing cache operations, said data storage device further comprising a cache manager is disclosed in figure 1 as #20, and it's operation is further discussed in column 6, line 35, for example.

With respect to claim 14, the cache manager comprising a manager configured to perform at least one of the following: translate an address of a different storage device (for example, back-end storage), cache data included in a write request, load data from the different storage device, and remove cached data is disclosed in column 6, line 35, for example. The controller #20 in Brant et al performs the functions of the instantly claimed cache manager as well as the instantly claimed controller of instant claim 1.

However, it happens that all of the following are anticipated by the cited prior art of record, with the instant claim limitations in parenthesis along with the relevant citation in Brant et al:

Requesting data from a back-end storage system (which inherently requires translating the address of that different storage system) (see column 6, lines 50-51);

Retrieving requested data (caching data included in a write request and loading data from the different storage device) from the [at least two] disks [making up the cache] (see column 4, lines 9-19);

Sending data to the back-end system for writing (column 6, lines 50-51);

Determining the location of back-end system data (more address translation) within the [at least two] disks [making up the cache] (column 4, lines 32-48).

Removing data from the [at least two] disks [making up the cache] (removing cached data) (column 4, lines 42-44).

With respect to claim 15, a controller card that includes the controller and connections available to couple with more than one storage card that provides access to the [a] the [at] least two of the [disk] drives is disclosed in column 5, lines 41-45, which discloses ASIC based daughter cards which the disclosed products of Brant et al can be based on. These products of Brant et al are what examiner is rejecting the instant claims over, so it logically follows that "these products" apply to the instant claim language.

With respect to claim 16, the storage card comprising a card having at least one parallel interface to a collection of the drives is disclosed column 5, line 30 as well as lines 41-45, for the reasons as discussed supra with respect to claim 15.

With respect to claim 18, the connection between the controller and storage card comprising a serial connection is disclosed in column 6, line 41, as "SCSI-type connections." SCSI has a serial as well as a parallel "type" connection, and, therefore, the cited passage anticipates the instant claim language.

With respect to claim 19, the controller comprising a bank interface that routes data requests to the appropriate bank of drives is disclosed in figure 1 as #15, as discussed in column 5, lines 54-56, for example.

With respect to claim 20, at least one first data storage device is disclosed in figure 1 as #25. The storage device having a platter size of at least 3.5 inches in diameter is disclosed in column 5, line 39. The hierarchy listed in column 5, from line 12 to line 28, shows the lower levels of the hierarchy having higher capacity disks. To increase capacity on a disk that uses a standard method of data storage, one must, inherently, increase the physical size, or platter size, of that disk.

More than two disk drives coupled to the controller are disclosed in figure 1 as #22, coupled by #15. The disk drives having platter sizes less than 3.5 inches in

Claim 31 is a "wherein clause" that merely states the result of the limitations in the claim upon which it depends and accordingly adds nothing to the patentability or substance of the claim. Applicants may define anything as they wish.

With respect to claim 33, a cache controller is disclosed by Brant et al in figure 1, #20.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brant et al and The RAID Book, as applied to claim 35 and claim 1, upon which the instant claims depend, above, and further in view of Eckerd et al (US Patent #6,078,498).

Brant et al and the RAID Book teach the data storage device as claimed in claims 35 and 1 of the instant application, and also teaches smaller form factor disk drives in column 1, line 42, for example.

The difference between Brant et al and The RAID Book and the instant claims are the explicit recitations of a housing, the housing having one of the following form factors: standard, half-height, and low-profile.

However, Eckerd et al disclose a top cover cooperating with the base deck to form an internal, scaled environment for the disc drive in column 3, lines 22-25. This is a housing. In column 6, lines 18-30, Eckerd et al disclose that housing to be a standardized form factor, including low profile, nominal, and half-height.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, having the teachings of Brant et al and the RAID Book and Eckerd et al before him/her, to utilize the housing and form factors of Eckerd et al in the invention of Brant et al, because smaller form factor disk drives permit disk subsystems to exploit performance advantages of having more disks to service requests in parallel, as discussed by Brant et al in column 1, lines 42-45, and because the relative configurations of the mounting plate and chassis can vary depending upon requirements of a given application, as discussed in column 5, lines 15-18 of Eckerd et al.

Conclusion

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian P. Chace whose telephone number is 571.272.4190. The examiner can normally be reached on MAXI FLEX.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 571.272.4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christian P. Chace
Primary Examiner
Art Unit 2189